Reg. No.												

Question Paper Code	12480

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023

Fourth Semester

Civil Engineering

20CEPC402 - STRENGTH OF MATERIALS II

(Regulations 2020)

Duration: 3 Hours Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

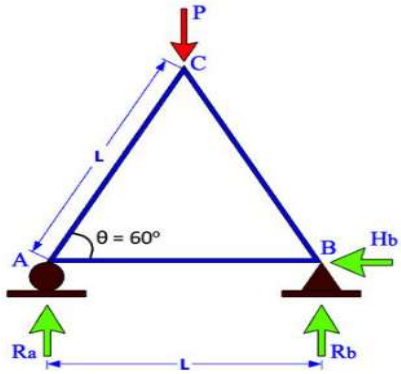
		Marks, K-Level, CO
1.	Define strain energy.	*2,K1,CO1*
2.	Explain Maxwell's reciprocal theorem.	*2,K2,CO1*
3.	What are the advantages and limitations of theorem of three moments?	*2,K1,CO3*
4.	Explain with examples the statically indeterminate structures.	*2,K2,CO3*
5.	What is slenderness ratio (buckling factor)?	*2,K1,CO4*
6.	Define thick cylinders.	*2,K1,CO4*
7.	Define principal planes and principal stress.	*2,K1,CO5*
8.	List the theories of failure.	*2,K1,CO5*
9.	Define: Shear centre.	*2,K1,CO6*
10.	Identify the expression for position of neutral axis in case of curved bars.	*2,K2,CO6*

PART - B (5 × 13 = 65 Marks)

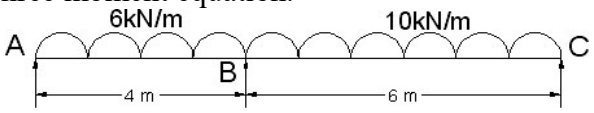
Answer ALL Questions

11.	a)	A weight of 10 KN falls by 30 mm on a collar rigidly attached to a vertical bar 4m long and 1000 mm^2 in section. Find the instantaneous stress of the bar. Take E = 210 GPa.	*13,K3,CO1*
		OR	
	b)	A tensile load of 80 kN is Suddenly applied on a circular bar of 4 cm in diameter and 5 m long. Calculate the strain energy in the rod if E = 200 GPa and I = 1440 cm^4.	*13,K3,CO1*
12.	a)	A beam of simply supported over a span of 3 m carries a uniformly distributed load of 20 KN/m over the entire span. Take EI=2.25 MN/m^2. Use Castigliano's theorem. Find the deflection at the centre of the beam.	*13,K3,CO2*
		OR	

b) Find the vertical deflection at C of the truss shown in figure. Take area of cross section of all members as 'a'and Young's modulus as 'E' = $2X10^5$ N/mm^2 and P = 60 kN with compression members subjected to a stress of 100N/mm^2,While the tension members subjected to a stress of 150 N/mm^2 *13,K3,CO2*



13. a) Draw the S.F. and B.M. diagrams for the continuous beam shown in the fig. Use three moment equation. *13,K3,CO3*



OR

b) A fixed beam ACB of span 6m is carrying a concentrated clockwise couple of 150 kNm applied at a section 4m from the left end. Find the end moments from the first principles. Draw BM and SF diagrams. *13,K3,CO3*

14. a) Determine the maximum and minimum hoop stress across the section of pipe of 400 mm internal diameter and 100 mm thick, the pipe contains a fluid at a pressure of 8 N/mm^2. Also sketch the radial pressure distribution and hoop stress distribution across the section. *13,K3,CO4*

OR

b) A 1.5 m long cast iron column has a circular cross section of 50 mm diameter. One end of the column is fixed in direction and position and the other is free. Taking factor of safety as 3, calculate the safe load using Rankine-Gordon formula. Take yield stress as 560 MPa and constant α=1/1600. *13,K3,CO4*

15. a) A cylindrical shell 1.2m diameter is to be made of mild steel plates. It is subjected to an internal pressure of 1.5 MN/m^2. If the material yields at 200 kN/m^2, calculate the thickness of the plate on the basis of following theories of failure assuming a FOS of 2 in each case. *13,K3,CO5*

(i) Maximum principal stress theory
(ii) Maximum shear stress theory
(iii) Maximum shear strain energy theory

OR

b) A solid circular shaft is subjected to a bending moment of 50 kNm and a torque of 20 kNm. Design the diameter of the shaft according to
(i)The maximum principal stress theory
(ii)The maximum shear stress theory
(iii)The maximum distortion energy theory
Take $\mu = 0.3$, stress at elastic limit = 300 N/mm^2, factor of safety = 2.5. *13,K3,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) A beam of T-section (flange: 100 × 20 mm, web: 150 mm × 10 mm) is 2.5 m in length and is simply supported at ends. It carries a load of 3.2 kN inclined 20° to the vertical and passing through the centroid of the section. If E= 2x10^5 MPa. Calculate the maximum tensile stress and maximum compressive stress. Also find the position of the neutral axis and deflection due to the load. *15,K3,CO6*

OR

b) A curved beam of rectangular cross section is subjected to pure bending with a moment of 400 N-m. The beam has width of 20 mm, depth of 40 mm and is curved in plane to the depth. The mean radius of curvature is 5 mm. Determine the position of neutral axis and the ratio of maximum to the minimum stress. Also, plot the variation of the bending stress across the section. *15,K3,CO6*